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## **1.0 PURPOSE AND APPLICABILITY**

This standard operating procedure (SOP) is a guide to archiving and maintenance of optical visibility monitoring data. The purpose of this SOP is to assure that the following data and information are secure and available:

- Nephelometer data
- Transmissometer data
- Associated meteorological data
- Supporting documentation

These archives are a historical record of both raw and processed data files and provide information that supports the documentation of existing conditions and trends in monitored areas. Duplicate copies of digital data are stored off-site to prevent data loss.

The following technical instructions (TIs) provide detailed information regarding specific archive procedures:

- TI 4600-5000     *Nephelometer Data Archives (IMPROVE Protocol)*
- TI 4600-5010     *Transmissometer Data Archives (IMPROVE Protocol)*

## **2.0 RESPONSIBILITIES**

### **2.1 PROJECT MANAGER**

The project manager shall:

- Ensure that archives are accessible, orderly, complete, and current.
- Ensure that duplicate archives are properly stored off-site.

### **2.2 DATA ANALYST**

The data analyst shall:

- Archive raw nephelometer and transmissometer data on a monthly basis.
- Archive processed nephelometer data on a quarterly basis.
- Archive processed transmissometer data on an annual basis.
- Maintain supporting hard copy documentation.
- Prepare and maintain data archive files and records.

### **3.0 REQUIRED EQUIPMENT AND MATERIALS**

Required equipment and materials include computer equipment and software, digital data, and supporting equipment and materials as discussed in the following subsections.

#### **3.1 COMPUTER EQUIPMENT AND SOFTWARE**

Optical visibility monitoring digital data archives are performed on IBM-PC compatible systems. Required computer system components and software include:

- IBM-PC Pentium class computer system with VGA and 80 megabyte hard disk and 64 megabytes of RAM
- Microsoft Windows98, or Windows2000 operating system
- CD-R drive (52x24x52)
- CD-Rs (1x-52x compatible 700mb capacity)
- CD labels
- 3.5" diskettes
- 3.5" diskette labels
- Creator Classic or compatible CD-writing software
- Laserjet printer

#### **3.2 DIGITAL DATA EQUIPMENT AND MATERIALS**

ASCII files must be available in a designated network ARS computer network directory. All optical data will be handled as ASCII files. Equipment and materials for maintaining digital data archives include:

- Three-ring binders
- Plastic storage diskette and CD pouches

#### **3.3 SUPPORTING DOCUMENTATION EQUIPMENT AND MATERIALS**

Supporting hard copy documentation for optical data is divided into two categories: site-based and instrument-based. All supporting documentation is archived on a continual basis. Equipment and materials for maintaining supporting documentation archives include:

- Manila file folders
- Hanging file folders
- Standard file cabinets

## **4.0 METHODS**

Archiving of raw digital data is performed on a monthly basis. Archiving of all raw and processed digital data is performed after data have been finalized and reported (generally quarterly for nephelometer data and annually for transmissometer data). All files are in ASCII format. Files are stored in their original formats (non-compressed) on CD and/or diskette and at least two copies of each archive CD are created. One CD is stored at ARS, the other(s) are stored off-site. Hard copies of supporting documentation are archived on a continual basis and stored in-office.

Procedures for archiving optical data are discussed in the following two (2) major subsections:

- 4.1 Nephelometer Data Archives
- 4.2 Transmissometer Data Archives

### **4.1 NEPHELOMETER DATA ARCHIVES**

#### **4.1.1 Nephelometer Digital Data Archives**

Table 4-1 outlines the nephelometer monthly and quarterly archive process. Raw data files (site-specific daily files collected by telephone modem, Internet (IP address), or downloaded from storage modules) are archived monthly. Level-1 validated files are archived quarterly.

Specific nephelometer archive procedures are detailed in TI 4600-5000, *Nephelometer Data Archives (IMPROVE Protocol)*.

#### **4.1.2 Nephelometer Supporting Documentation Archives**

Supporting hard copy documentation is archived on a continual basis. Nephelometer monitoring support documentation includes the following:

- Site specifications
- Site servicing trip reports
- Monitoring timelines
- Data analyst/site operator correspondence
- Site operator log sheets
- Instrument calibration and audit reports
- Instrument maintenance logs
- Weekly and quarterly data plots
- Quarterly summary history forms
- Quarterly uncertainty printouts

Table 4-1

Archiving Procedures for Nephelometer and  
Associated Digital Data and Supporting Information

<b>Nephelometer Data Archives</b>			
<b>Timing</b>	<b>File Types Archived</b>	<b>Media</b>	<b>Disposition</b>
<b>Monthly Archive of Nephelometer Digital Data</b>			
By the 10 <sup>th</sup> of the month following the month of record	<ul style="list-style-type: none"> <li>Raw data files (site-specific daily files collected by telephone modem, Internet (IP address), or downloaded from storage modules)</li> </ul>	CD-R	<ul style="list-style-type: none"> <li>One copy at ARS</li> </ul>
<b>Quarterly Archive of Nephelometer Digital Data</b>			
After data have been finalized and reported (within 90 days after the end of a quarter)	<ul style="list-style-type: none"> <li>Processed Level-1 data files (xxxxx_N11 files)</li> </ul>	CD-R	<ul style="list-style-type: none"> <li>One copy at ARS</li> <li>One copy off-site</li> <li>One copy to CIRA</li> </ul>
<b>Archive of Supporting Hard Copy Documentation</b>			
Continuously	<ul style="list-style-type: none"> <li>Site specifications</li> <li>Site servicing trip reports</li> <li>Monitoring timelines</li> <li>Data analyst/site operator correspondence</li> <li>Site operator log sheets</li> <li>Instrument calibration and audit reports</li> <li>Instrument maintenance logs</li> <li>Weekly plots</li> <li>Quarterly plots</li> <li>Quarterly summary history forms</li> <li>Quarterly uncertainty printouts</li> </ul>	Hard copies	<ul style="list-style-type: none"> <li>On file at ARS or ARS storage</li> </ul>

## 4.2 TRANSMISSOMETER DATA ARCHIVES

### 4.2.1 Transmissometer Digital Data Archives

Table 4-2 outlines the transmissometer monthly and quarterly archive process. Raw data files (daily Wallops files) are archived monthly. Level-1 validated files (weather-removed) are archived annually.

Specific transmissometer archive procedures are detailed in TI 4600-5010, *Transmissometer Data Archives (IMPROVE Protocol)*.

Table 4-2

Archiving Procedures for Transmissometer and  
Associated Digital Data and Supporting Information

<b>Transmissometer Data Archives</b>			
<b>Timing</b>	<b>File Types Archived</b>	<b>Media</b>	<b>Disposition</b>
<b>Monthly Archive of Nephelometer Digital Data</b>			
By the 10 <sup>th</sup> of the month following the month of record	<ul style="list-style-type: none"> <li>Raw data files (site-specific daily Wallops files)</li> </ul>	3.5" diskette	<ul style="list-style-type: none"> <li>One copy at ARS</li> </ul>
Bi-monthly	<ul style="list-style-type: none"> <li>Raw data files (site-specific daily Wallops files)</li> </ul>	CD-R	<ul style="list-style-type: none"> <li>One copy at ARS</li> </ul>
<b>Annual Archive of Nephelometer Digital Data</b>			
After data have been finalized and reported	<ul style="list-style-type: none"> <li>Processed Level-1 data files (xxxxx_T1W files)</li> </ul>	CD-R	<ul style="list-style-type: none"> <li>One copy at ARS</li> <li>One copy off-site</li> <li>One copy to CIRA</li> </ul>
<b>Archive of Supporting Hard Copy Documentation</b>			
Continuously	<ul style="list-style-type: none"> <li>Site specifications</li> <li>Monitoring timelines</li> <li>Data analyst/site operator correspondence</li> <li>Site operator log sheets</li> <li>Instrument calibration and audit reports</li> <li>Instrument maintenance logs</li> <li>Bi-monthly plots</li> <li>Quarterly plots</li> <li>Quarterly summary history forms</li> </ul>	Hard copies	<ul style="list-style-type: none"> <li>On file at ARS or ARS storage</li> </ul>

**4.2.2 Transmissometer Supporting Documentation Archives**

Supporting hard copy documentation is archived on a continual basis. Transmissometer monitoring support documentation includes the following:

- Site specifications
- Monitoring timelines
- Data coordinator/site operator correspondence
- Site operator log sheets
- Instrument calibration and audit reports
- Instrument maintenance logs
- Bi-monthly and quarterly plots
- Quarterly summary history forms





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## **1.0 PURPOSE AND APPLICABILITY**

This technical instruction (TI) is a guide to archiving nephelometer-based optical visibility monitoring data. The purpose of this TI is to assure that data and supporting information are secure and available. This TI is referenced from Standard Operating Procedure (SOP) 4600, *Optical Monitoring Data Archives*.

## **2.0 RESPONSIBILITIES**

### **2.1 PROJECT MANAGER**

The project manager shall:

- Ensure that archives are accessible, orderly, complete, and current.
- Ensure that duplicate archives are properly stored off-site.

### **2.2 DATA ANALYST**

The data analyst shall:

- Archive raw nephelometer data on a monthly basis.
- Archive processed nephelometer data on a quarterly basis.
- Maintain supporting hard copy documentation.
- Prepare and maintain data archive files and records.

## **3.0 REQUIRED EQUIPMENT AND MATERIALS**

Required equipment and materials include computer equipment and software, digital data, and supporting equipment and materials as discussed in the following subsections.

### **3.1 COMPUTER EQUIPMENT AND SOFTWARE**

Optical visibility monitoring digital data archives are performed on IBM-PC compatible systems. Required computer system components and software include:

- IBM-PC Pentium class computer system with VGA and 80 megabyte hard disk and 64 megabytes of RAM
- Microsoft Windows98, or Windows2000 operating system
- CD-R drive (52x24x52)
- CD-Rs (1x-52x compatible 700mb capacity)

- Creator Classic or compatible CD-writing software
- PKZIP or compatible file compression software
- CD labels
- Laserjet printer

### **3.2 DIGITAL DATA EQUIPMENT AND MATERIALS**

ASCII files of nephelometer data (raw, Level-A, Level-0, and Level-1) must be available in a designated ARS computer network directory. All nephelometer data will be handled as ASCII files. Equipment and materials for maintaining digital data archives include:

- Three-ring binders
- Plastic storage CD pouches

### **3.3 SUPPORTING DOCUMENTATION EQUIPMENT AND MATERIALS**

Supporting hard copy documentation for nephelometer data is divided into two categories: site-based and instrument-based. All supporting documentation is archived on a continual basis. Equipment and materials for maintaining supporting documentation archives include:

- Manila file folders
- Hanging file folders
- Standard file cabinets

## **4.0 METHODS**

Table 4-1 outlines archiving procedures for nephelometer and associated digital data and supporting information. Details of each archive procedure are described in the following four (4) major subsections:

- 4.1 Monthly Archive of Nephelometer Digital Data
- 4.2 Quarterly Archive of Nephelometer Digital Data
- 4.3 Disposition of Digital Data
- 4.4 Disposition of Supporting Documentation

Table 4-1

Archiving Procedures for Nephelometer and  
Associated Digital Data and Supporting Information

Nephelometer Data Archives			
Timing	File Types Archived	Media	Disposition
<b>Monthly Archive of Nephelometer Digital Data</b>			
By the 10 <sup>th</sup> of the month following the month of record	<ul style="list-style-type: none"> <li>Raw data files (site-specific daily files collected by telephone modem, Internet (IP address), or downloaded from storage modules)</li> </ul>	CD-R	<ul style="list-style-type: none"> <li>One copy at ARS</li> </ul>
<b>Quarterly Archive of Nephelometer Digital Data</b>			
After data have been finalized and reported (within 90 days after the end of a quarter)	<ul style="list-style-type: none"> <li>Processed Level-1 data files (xxxxx_N11 files)</li> </ul>	CD-R	<ul style="list-style-type: none"> <li>One copy at ARS</li> <li>One copy off-site</li> <li>One copy to CIRA</li> </ul>
<b>Archive of Supporting Hard Copy Documentation</b>			
Continuously	<ul style="list-style-type: none"> <li>Site specifications</li> <li>Site servicing trip reports</li> <li>Monitoring timelines</li> <li>Data analyst/site operator correspondence</li> <li>Site operator log sheets</li> <li>Instrument calibration and audit reports</li> <li>Instrument maintenance logs</li> <li>Weekly plots</li> <li>Quarterly plots</li> <li>Quarterly summary history forms</li> <li>Quarterly uncertainty printouts</li> </ul>	Hard copies	<ul style="list-style-type: none"> <li>On file at ARS or ARS storage</li> </ul>

#### 4.1 MONTHLY ARCHIVE OF NEPHELOMETER DIGITAL DATA

Raw nephelometer data files are archived on a monthly basis. By the 10<sup>th</sup> of each month following the month of record, raw data files downloaded via telephone modem, Internet (IP address), or storage module, are archived onto compact disc (CD-R). Raw data files (site-specific daily files) are located on the ARS computer network on the O:/neph/daily directory. The naming convention for the raw data files is:

xxxxxydn.jjj (modem collected data)  
xxxxxyys.jjj (storage module collected data)

where:

xxxxx = 5-character site code  
yy = two-digit year  
d = "Daily" or a numeral indicating the number of times retry is attempted  
-or-  
n = Data source (D or 1-9 for modem collection)  
s = Storage module  
jjj = Julian date

Monthly archiving of raw data files is a three-part process performed by the data analyst as described below:

MOVE FILES TO ARCHIVE DIRECTORY	The files are <i>moved</i> from the O:/neph/daily directory to the O:/neph/raw_zip/temp directory using the program Moveall.bat (only moves the appropriate files to be archived).
COPY FILES TO LOCAL DRIVE AND ARCHIVE	The data set is <i>copied</i> to a local hard drive directory (i.e., C:/neph data/monthly archive), then archived to CD-R using CD-writing software. The files are then deleted from the local drive. One CD is created and labeled containing the archive.
COMPRESS FILES ON ARCHIVE DIRECTORY	The files on the temp directory are moved to O:/neph/raw_zip and then zipped, or compressed into site-specific zip files using PKZIP or other comparable file compression program. The zipped files in O:/neph/raw_zip are maintained there for several years.

#### 4.2 QUARTERLY ARCHIVE OF NEPHELOMETER DIGITAL DATA

Quarterly archive is performed according to calendar quarters, defined as:

1 <sup>st</sup> Quarter	(January, February, and March)
2 <sup>nd</sup> Quarter	(April, May, and June)
3 <sup>rd</sup> Quarter	(July, August, and September)
4 <sup>th</sup> Quarter	(October, November, and December)

The Level-1 processed, or validated data files are archived to CD-R quarterly, following final data processing (within 90 days after the end of a quarter). The file naming convention for Level-1 nephelometer data files is:

xxxxx\_N1p.yyq

where:

xxxxx	= 5-character site code
N	= Nephelometer data
1	= Level-1 data
p	= Averaging period in hours
yy	= two-digit year
q	= Calendar quarter (1, 2, 3, or 4)

Quarterly nephelometer data archiving is a three-part process performed by the data analyst as described below:

CREATE README FILE	A Readme file is created, containing all site and file names sorted by monitoring network or project, and a nephelometer file code key is obtained (refer to TI 4400-5010, <i>Nephelometer Data Reduction and Validation (IMPROVE Protocol)</i> ).
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GATHER FILES FOR ARCHIVE	The Readme and file code key files are placed where the processed data files (Level-1 files) reside on the ARS computer network (O:/neph/pppppppp/yyyy, where <i>pppppppp</i> is the project (e.g., IMPROVE, USFS, ADEQ, LADCO, etc.) and <i>yyyy</i> is the four-digit year).
COPY FILES TO LOCAL DRIVE AND ARCHIVE	The data set is <i>copied</i> to a local hard drive directory (i.e., C:/neph data/quarterly archive and archived to CD-R using CD-writing software. The files are then deleted from the local drive. Three CDs are created and labeled. The file copies on O:/drive are maintained there for several years.

### 4.3 DISPOSITION OF DIGITAL DATA

Archive CDs and records are distributed as follows:

- One monthly archive CD is maintained in the Data Collection Center (DCC) at ARS in a three-ring binder labeled Nephelometer Data CD Archive. The CD is placed in a plastic protector pouch with a hard copy of the archive file listing.
- Three quarterly archive CDs are created. One is maintained in the DCC, one is stored off-site, and the third is delivered to the Cooperative Institute for Research in the Atmosphere (CIRA).

### 4.4 DISPOSITION OF SUPPORTING DOCUMENTATION

Supporting hard copy documentation is archived continually. The documentation is located in the DCC in labeled three-ring binders and in labeled file cabinets.

#### 4.4.1 Site-Based Supporting Hard Copy Documentation

Site-based nephelometer monitoring support documentation includes:

- Site specifications (refer to TI 4070-3000, *Installation of Optec NGN-2 Nephelometer Systems (IMPROVE Protocol)* and TI 4070-3001, *Site Documentation for Optec NGN-2 Nephelometer Systems*)
- Monitoring timelines  
Data analyst/site operator correspondence  
Site operator log sheets  
(refer to TI 4100-3100, *Routine Site Operator Maintenance Procedures for Optec NGN-2 Nephelometer Systems – Type 1 (IMPROVE Protocol)*) and TI 4100-3105, *Routine Site Operator Maintenance Procedures for Optec NGN-2 Nephelometer Systems – Type 2 (IMPROVE Protocol)*)
- ARS trip reports from yearly site visits (refer to TI 4115-3005, *Annual Site Visit Procedures for Optec NGN-2 Nephelometer Systems (IMPROVE Protocol)*)

- Weekly plots  
Quarterly summary plots  
Annual summary plots  
Quarterly uncertainty printouts  
(refer to TI 4400-5010, *Nephelometer Data Reduction and Validation (IMPROVE Protocol)*)
- Quarterly summary history forms

#### **4.4.2 Instrument-Based Supporting Hard Copy Documentation**

Instrument-based nephelometer monitoring support documentation includes:

- Instrument calibration (refer to TI 4200-2000, *Calibration of Optec NGN-2 Nephelometers – Type 1 (IMPROVE Protocol)*) and TI 4200-2005, *Calibration of Optec NGN-2 Nephelometers – Type 2 (IMPROVE Protocol)*)
- Instrument maintenance logs (refer to TI 4100-3400, *Nephelometer Annual Laboratory Maintenance (IMPROVE Protocol)*)
- Field audit reports (refer to SOP 4700, *Optec NGN-2 Nephelometer Audit Procedures (IMPROVE Protocol)*)